



FORMAN CHRISTIAN COLLEGE (A Chartered University)

PHYS 422: Nuclear Physics (3 credit hours)

Course Outline

Fall 2021

Instructor Information	
Name	Dr. Fareeha Hameed
Email	fareehahameed@fccollege.edu.pk
Skype Name	hameedfareeha
Online Advising	Appointments by Email/SMS/WhatsApp For E-mail, include “PHYS 422 – Nuclear Physics” in the subject line Office hours will be announced on Moodle when campus opens. Office S-020
Online Classes	Will be held on Zoom, and recordings will be uploaded to Moodle. The time will be announced on moodle
Course Material/ Announcements	Will be uploaded on Moodle
Course Information	
Course Objectives	In this course, the fundamental principles of Nuclear Physics will be discussed. The concepts and ideas will be introduced. The mathematical equations and formulas needed will be studied. Some applications will also be taught in order to illustrate the practical applications of these principles which are sometimes abstract. This aim is to equip students with the understanding and tools to pursue further specialization, research and professions in the important applications of radiations and nuclear Physics.
Learning Outcomes:	On Successful completion of this course the student will be able to: <ul style="list-style-type: none">• Acquire an understanding of fundamental principles of nuclear physics• Apply Nuclear Physics in practical fields• Describe various career options in Applied Nuclear Physics• Develop independent problem solving skills
Text Books & Reference Material	<ul style="list-style-type: none">• Introductory Nuclear Physics by Kenneth S. Krane, 2008, Wiley• Nuclear Physics, John Lilley, Wiley 2002• Brian Martin - Nuclear and particle physics-Wiley (2009)• Irving Kaplan, Nuclear Physics, Narosa Publishing House, Nineteenth Reprint, 2002• Fundamentals In Nuclear Physics, Jean-Louis Basdevant James Rich Michel Spiro, Springer 2005• Online lectures, videos (links will be given on Moodle)

<p>Course Requirements & Important things to know</p>	<ul style="list-style-type: none"> • All examinations, tests and assignments shall be cumulative, i.e. may or may not contain material from previous assignments and tests. • <u>Technology Use:</u> The Moodle platform will be used for making announcements, sharing material, submission of assignments, and conducting quizzes, Exams, etc. Zoom will be used for online classes. Notifications will be sent on your official emails • Students are required to watch/listen to online lectures and do relevant readings. They are also required to watch online videos as instructed. • <u>Due Dates:</u> <ul style="list-style-type: none"> ○ All assignments are to be submitted by 4:00 p.m. on the due date. ○ Late activities will not be graded, unless previous accommodations have been made. In case of any other limitations (internet), inform prior to the deadline. Avoid submitting at the last moment. Make prior arrangements to avoid any technological problems ○ There are no make-up exams. • <u>Academic Honesty:</u> <ul style="list-style-type: none"> ○ All work that you submit in this course must be your own. ○ Unauthorized group efforts are considered academic dishonesty. ○ You may discuss homework (Assignments, Lab Exams) in a general way with others, but you may not consult anyone else's written work. ○ You are guilty of academic dishonesty if you examine another's solution, allow (actively or passively) another student to examine your solution, or you copy from the Internet without complete understanding of what you have done. University policy of plagiarism will be applicable in the case. ○ All cases no matter how trivial they are will be reported to Academic Integrity Committee (AIC) of FCCU. Cheating or violation of academic integrity in any exam will cause F grade. ○ <u>Ethics:</u> Ethics violations on exams, quizzes, assignments or any other course activities will be reported to the AIC (Academic Integrity Committee) and action will be taken according to AIP (Academic Integrity Policy) of FCC. 		
<p>Assessment Criteria</p>	<p>Assignments</p>	<p>20%</p>	
	<p>Class participation</p>	<p>10%</p>	
	<p>Paper</p>	<p>20%</p>	
	<p>Presentation</p>	<p>25%</p>	
	<p>Viva Exam</p>	<p>25%</p>	

Assessment	<ul style="list-style-type: none"> • <u>Assignments:</u> Students will be notified about it on Moodle and will be required to submit them by the deadline. Students may be asked to give a viva for the assignment via Zoom. • <u>Paper</u> Each student will select a topic relevant to the course. The topic will be approved by the instructor. • <u>Presentation</u> <ul style="list-style-type: none"> ○ Each student will give a presentation for about 15 minutes. After this presentation there will be detailed questions and answers session on Zoom. ○ The student will also submit the presentation recording for grading. • <u>Final viva exam:</u> Students will be notified about it on Moodle and will be required to submit them by the deadline. Students may be asked to give a viva for the assignment via Zoom. <p><u>Assessment Schedule will be announced in Zoom class and posted on Moodle and notification sent by email</u></p>																										
Course Content	<ul style="list-style-type: none"> • Structure of the nucleus • Radiation and decay • Detection of radiation • Nuclear forces • Nuclear reactions • Reaction and stability of nuclear models 																										
Lesson Plan	<table border="1"> <thead> <tr> <th data-bbox="510 1057 808 1097">Week No.</th> <th data-bbox="808 1057 1560 1097">Topics</th> <th data-bbox="1560 1057 1980 1097">Assessments and Activities</th> </tr> </thead> <tbody> <tr> <td data-bbox="510 1097 808 1138">1st Week</td> <td data-bbox="808 1097 1560 1138">Introduction</td> <td data-bbox="1560 1097 1980 1138">Reading and practice HW</td> </tr> <tr> <td data-bbox="510 1138 808 1179">2nd Week</td> <td data-bbox="808 1138 1560 1179">Basic properties of the nucleus</td> <td data-bbox="1560 1138 1980 1179">Reading and practice HW</td> </tr> <tr> <td data-bbox="510 1179 808 1219">3rd Week</td> <td data-bbox="808 1179 1560 1219">Alpha – Decay concepts and principles</td> <td data-bbox="1560 1179 1980 1219">HW Problems</td> </tr> <tr> <td data-bbox="510 1219 808 1260">4th Week</td> <td data-bbox="808 1219 1560 1260">Alpha decay derivations</td> <td data-bbox="1560 1219 1980 1260">Reading and practice HW</td> </tr> <tr> <td data-bbox="510 1260 808 1300">5th Week</td> <td data-bbox="808 1260 1560 1300">Beta – Decay concepts and principles</td> <td data-bbox="1560 1260 1980 1300">Paper draft submission</td> </tr> <tr> <td data-bbox="510 1300 808 1341">6th Week</td> <td data-bbox="808 1300 1560 1341">Beta – Decay derivations and problems</td> <td data-bbox="1560 1300 1980 1341">1st assignment</td> </tr> <tr> <td data-bbox="510 1341 808 1446">7th and 8th Week</td> <td data-bbox="808 1341 1560 1446">Gamma – rays</td> <td data-bbox="1560 1341 1980 1446">Paper submission</td> </tr> </tbody> </table>	Week No.	Topics	Assessments and Activities	1 st Week	Introduction	Reading and practice HW	2nd Week	Basic properties of the nucleus	Reading and practice HW	3rd Week	Alpha – Decay concepts and principles	HW Problems	4th Week	Alpha decay derivations	Reading and practice HW	5th Week	Beta – Decay concepts and principles	Paper draft submission	6th Week	Beta – Decay derivations and problems	1st assignment	7th and 8th Week	Gamma – rays	Paper submission		
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	9th Week	Nuclear Reactions concepts and principles		HW Problems
	10th Week	Nuclear reactions derivations		2nd Assignment
	11th Week	Nuclear Forces		Reading HW
	12th Week	Nuclear Structure		Presentation
	13th Week	Detecting nuclear radiations		Practice HW
	14th Week	Problem solving		Final viva exam
Grading Scale	Grade	Quality Point	Numerical Value	Meaning
	A	4.00	93-100	Superior
	A-	3.70	90-92	
	B+	3.30	87-89	
	B	3.00	83-86	Good
	B-	2.70	80-82	
	C+	2.30	77-79	
	C	2.00	73-76	Satisfactory
	C-	1.70	70-72	
	D+	1.30	67-69	
	D	1.00	60-66	Pass
F	0.00	59 or below	Fail	

Disclaimer

Considering the situation of the COVID-19 pandemic, the course instructor reserves the right to modify the above plan as need be during the course of the class; however, it won't be done impetuously. Any changes that would be incorporated will be informed in advance.